QNO1; the diagram shows a sector of a circle with centre *O*. The radius of the circle is 8 cm

PRS is an arc of the circle

***PS* is a chord of the circle.**

Angle *POS* = 40°

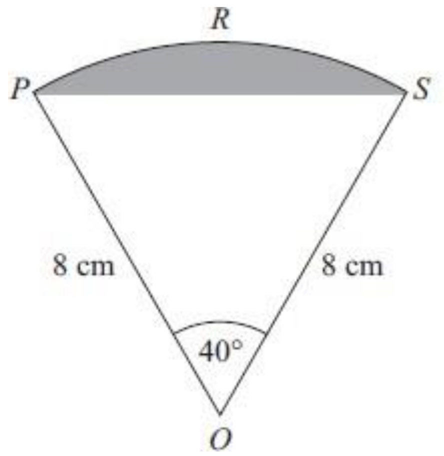

Diagram **NOT** accurately drawn

Calculate the area of the shaded segment.

Give your answer correct to 3 significant figures.

ANS; SECTOR = $\frac{40}{360}\pi(8)^2$

$=22.34021\text{cm}^2$

Triangle=$\frac{1}{2}(8)(8)\sin 40^0$

$=20.56920\text{cm}^2$

Shaded area=sector-triangle

$=1.7709\text{cm}^2$

QNO 2; in a disastrous first flight, an experimental paper airplane follows the trajectory of the particle

x = t −3sint, y=4−3cost (t ≥0)

But crashes into a wall at time t =10

(a) At what times was the airplane flying horizontally?

(b) At what times was it flying vertically?

Solution (a). The airplane was flying horizontally at those times when $dy/dt = 0$ and $dx/dt \neq 0$. From the given trajectory we have

$dy/dt = 3\sin t$ and $dx/dt = 1-3\cos t$

Setting $dy/dt = 0$yieldstheequation$3\sin t = 0$, or, more simply, $\sin t=0$.

This equation has four solutions in the time interval $0 \leq t \leq 10$: $t = 0$, $t = \pi$, $t = 2\pi$, $t = 3\pi$

Since $dx/dt = 1-3\cos t \neq 0$ for these values of t (verify), the airplane was flying horizontally at times

$t = 0$, $t = \pi \approx 3.14$, $t = 2\pi \approx 6.28$, and $t = 3\pi \approx 9.42$

Which is consistent

Solution (b). The airplane was flying vertically at those times when $dx/dt = 0$ and dy/dt ————————————————=0. Setting $dx/dt = 0$ in yields

$1-3\cos t = 0$ or $\cos t = 1/3$

This equation has three solutions in the time interval $0 \leq t \leq 10$

t =cos−1 1 3, t =2π−cos−1 1 3, t =2π+cos−1 1 3

Q NO 3; A particle travels along a path defined by the following set of parametric equations. Determine the total distance the particle travels and compare this to the length of the parametric curve itself.

$x=4\sin(1/4t)$ $\quad$ $y=1-2\cos 2(1/4t)-52$ $\quad$ $\pi \leq t \leq 3/4\pi$

To find the length we'll need the following two derivatives,

$dx/dt=\cos(1/4t)$ $\qquad$ $dy/dt=\cos(1/4t)\sin(1/4t)$

The ds for this problem is then,

$ds=\sqrt{\boxed{[\cos(1/4t)]^2+[\cos(1/4t)\sin(1/4t)]^2}}\,dt=\sqrt{\boxed{\cos2(1/4t)+\cos2(1/4t)\sin2(1/4t)}}\,dt$

The integral for the length of the curve is now,

$$L=\int_{-2\pi}^{2\pi}\cos(1/4t)\sqrt{\boxed{1+\sin^2(1/4t)}}\,dt$$

$L=\int_{2\pi}^{2\pi} \cos(1/4t)\ 1+\sin^2(1/4t)\ dt$

$\sqrt{\boxed{1+u2}}=\sec\theta^2+u^2=\sec\theta$

the length of the curve is then,

$L=\int_{-2\pi}^{2\pi} \sqrt{\boxed{\cos^2(14t)(1+\sin^2(14t))}}\,dt$

$=\int_{1}^{1} 4\sqrt{\boxed{1+u2}}du=\int\pi4-\pi44\sec3\theta d\theta=2[\sec\theta\tan\theta+\ln|\sec\theta+\tan\theta|]|=\boxed{9.1824}$

<u>Qno 4</u> Refer to Figure 8. Suppose we have a circle of radius 10cm and an arc of length 15cm. suppose we want to find

(a) The angle θ,

(b) The area of the sector OAB,

(c) The area of the minor segment (shaded).

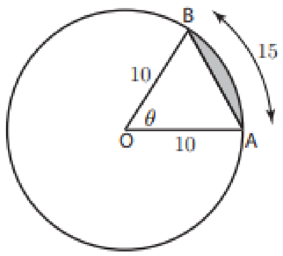

Figure . The shaded area is called the minor segment.

(a) Using s = rθ we have 15 = 10θ and so θ = 15 10 = 1.5 c.

(b) Using the formula for the area of the sector, A = 1 2 r 2 θ,

We find area = 1 2 r 2 θ = 1 2 (102) (1.5) = 75 cm2

We already know that the area of the sector OAB is 75cm^2.

If we can work out the area of the triangle AOB we can then determine the area of the minor segment. (Recall the formulae for the area of triangle, A = ½ ab sin C.

Area of triangle = ½ r^2 sin θ = ½ (102) sin 1.5 = 49.87 cm2

Therefore the   of the minor segment is =75 − 49.87 = 25.13 cm^2 (to 2 dp.)